Qualitative Mobile Source Air Toxics (MSAT) Analysis Report

Opportunity Corridor
Cuyahoga County, OH

Submitted to:

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EXECUTIVE SUMMARY

This report presents the mobile source air toxics (MSAT) analysis for the proposed Opportunity Corridor Preferred Alternative. The document presents background information on MSATs, the results of the qualitative analysis and serves as the supporting technical data for the Opportunity Corridor Environmental Impact Statement. The analysis follows the September, 2009, FHWA guidance for the analysis of mobile source air toxics (MSATs) in the National Environmental Policy Act (NEPA) process for highway projects. A Tier II Qualitative MSAT Analysis was prepared.

The approximately 3.0 mile long Opportunity Corridor project begins near I-490 at East 55th Street at the southwest and terminates along East 105th Street near US-322 (Chester Avenue) at the northeast. The proposed alignment parallels the existing railroad transportation corridor that contains the rail lines owned and operated by the NS and the GCRTA from East 55th Street to East 105th Street and then follows East 105th Street to the north. The study area consists of residential, commercial, industrial and recreational areas.

In this report, the FHWA and ODOT have provided a qualitative analysis of MSAT emissions relative to the Opportunity Corridor No-Build and Build alternatives. The FHWA and ODOT have acknowledged that the project may result in increased exposure to MSAT emissions in certain locations, although the concentrations and duration of exposures are uncertain, and because of this uncertainty, the health effects from these emissions cannot be reliably estimated. With either the No-Build or Build Alternatives, MSAT emissions in the study area will be substantially reduced in the future due to implementation of EPA's vehicle and fuel regulations.

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1.0 PROJECT DESCRIPTION

The Opportunity Corridor project is located in the City of Cleveland, Cuyahoga, Ohio along the existing railroad transportation corridor that contains the rail lines owned and operated by Norfolk Southern (NS) and Greater Cleveland Regional Transit Authority (GCRTA) with the CSX mainline being the approximate eastern boundary of the study area. The purpose of the Opportunity Corridor project is to improve the transportation infrastructure, access, and mobility within a historically underserved, economically depressed area within the City of Cleveland. As part of this, the proposed project must support the City of Cleveland's efforts to revive and redevelop large tracks of vacant residential and industrial land within the City of Cleveland's southeast side.

The study area consists of residential, commercial, industrial and recreational areas. The zoning in the study area is extensively mixed, and land use varies from parcel to parcel. This area developed prior to the establishment of zoning codes resulting in residential properties being located immediately adjacent to industrial properties. Future development in the project study area will follow the City's comprehensive plan, which is entitled *Connecting Cleveland 2020 Citywide Plan*.

The Ohio Department of Transportation (ODOT) and the Federal Highway Administration (FHWA), in coordination with the City of Cleveland are undertaking the Opportunity Corridor project using federal funds. There are no funds in place at this time for the completion of contract plans, real estate acquisition, utility relocation or construction. Funds are in place for completion of the next phase – contract plans for the Woodland Avenue to Chester Avenue section. Funds are also in place for a portion of the real estate acquisition within this section. ODOT is investigating both traditional and Public Private Partnership (P3) opportunities for the overall project as part of the financial plan.

The proposed transportation infrastructure improvements would begin near I-490 at East 55th Street at the southwest and terminate along East 105th Street north of US-322 (Chester Avenue) at the northeast as shown in Figure 1. The facility, as proposed, would be a multi-lane urban arterial boulevard with wide outside travel lanes for shared use with bicycle traffic. The proposed boulevard would also include a multi-use path on the south side of the roadway and a sidewalk on the north side of the roadway. The proposed alignment is depressed under East 55th Street. As the project progresses to the east, the boulevard returns to existing street grade and includes signalization at major intersections. In addition to the grade separation at East 55th Street, grade separation structures are proposed for locations where the new roadway crosses the existing rail lines owned and operated by NS and GCRTA. Northeast of Kinsman Road, the mainline would be south of and parallel to Grand Avenue. At the intersection with East 79th Street, the mainline begins to turn to the northeast. From East 79th Street to Quincy Avenue, the boulevard parallels the GCRTA Red line/ NS Nickel Plate rail line trench to the north. Minor adjustments in direction occur at almost all intersections until just past East 93rd Street when the mainline begins a gradual turn to north so that it meets up with East 105th Street at Quebec Avenue. From Quebec Avenue to the northern terminus, East 105th Street would be generally widened along the existing alignment with variations to minimize impacts to adjacent buildings.

2.0 PURPOSE OF THE REPORT

This report presents the mobile source air toxics (MSAT) analysis for the proposed Opportunity Corridor Preferred Alternative. The document presents background information on MSATs, the results of the qualitative analysis and serves as the supporting technical data for the Opportunity Corridor Environmental Impact Statement.

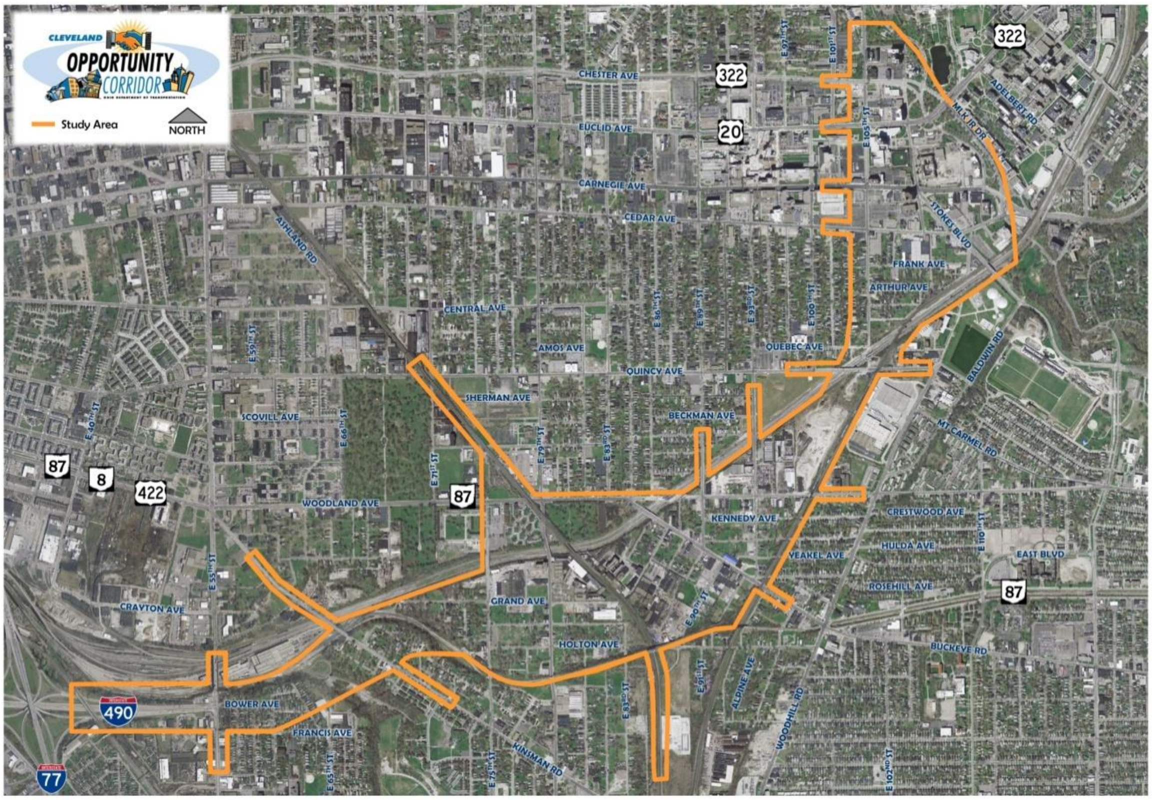


Figure 1 Project Location Map

3.0 MOBILE SOURCE AIR TOXICS (MSAT)

"In addition to the criteria air pollutants for which there are the National Ambient Air Quality Standards, EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries)."[1]

3.1 MSAT Background

In September, 2009, FHWA issued updated guidance for the analysis of mobile source air toxics (MSATs) in the NEPA process for highway projects (*Interim Guidance Update on Air*

[1] Cynthia J. Burbank Memorandum to Division Administrators, "Interim Guidance on Air Toxic Analysis in NEPA Documents", Federal Highway Administration, February 3, 2006, Appendix C, first paragraph.

Toxic Analysis in NEPA Documents). The following language is taken verbatim from these guidance documents.[2]

“Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, whereby Congress mandated that the U.S. Environmental Protection Agency (EPA) regulate 188 air toxics, also known as hazardous air pollutants. The EPA has assessed this expansive list in their latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007) and identified a group of 93 compounds emitted from mobile sources that are listed in their Integrated Risk Information System (IRIS) (http://www.epa.gov/iris/). In addition, EPA identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (NATA) (http://www.epa.gov/ttn/atw/nata1999/). These are *acrolein, benzene, 1,3-butidiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter*. While FHWA considers these the priority mobile source air toxics, the list is subject to change and may be adjusted in consideration of future EPA rules.

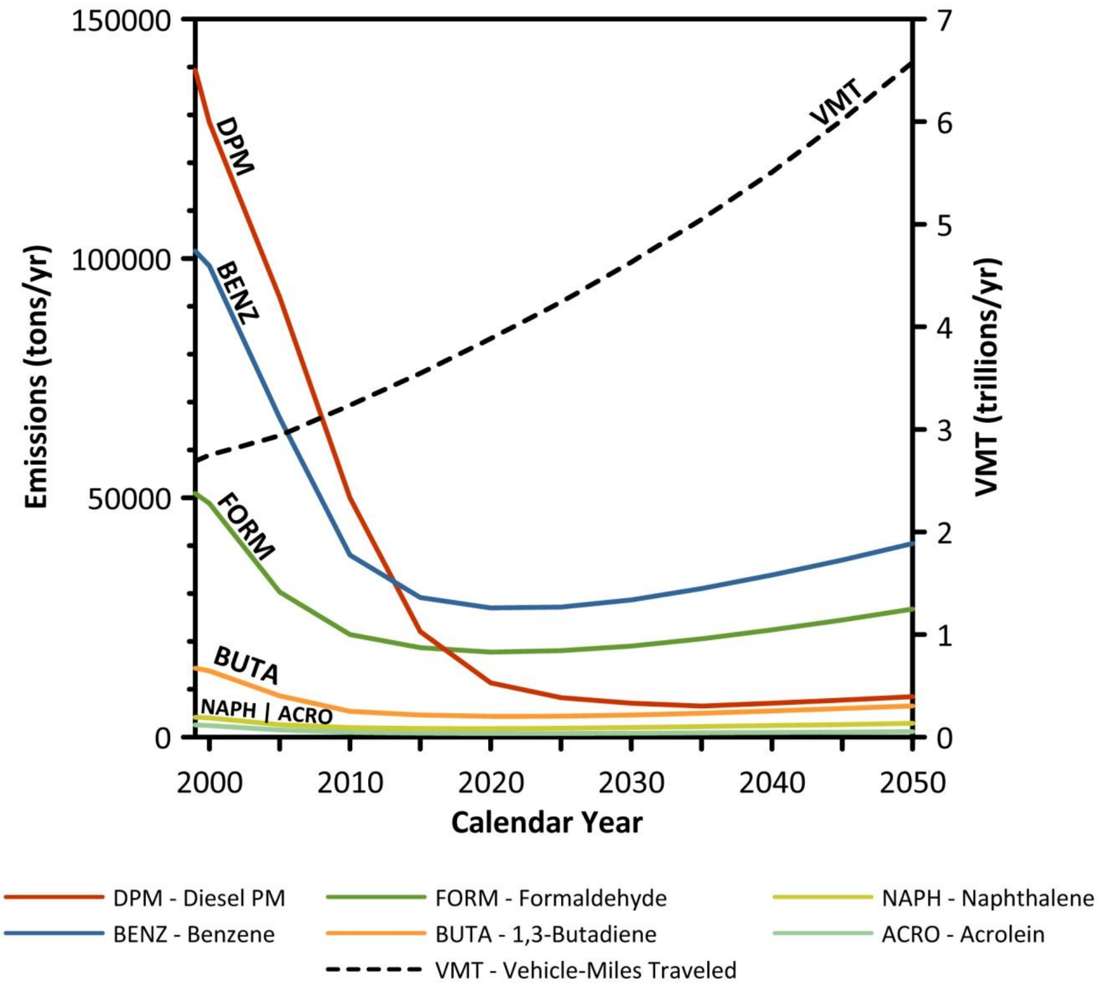
“The 2007 EPA rule mentioned above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. According to an FHWA analysis using EPA’s MOBILE6.2 model, even if vehicle activity (vehicle-miles travelled, VMT) increases by 145 percent as assumed, a combined reduction of 72 percent in the total annual emission rate for the priority MSAT is projected from 1999 to 2050, as shown in [Figure 2].

“Air toxics analysis is a continuing area of research. While much work has been done to assess the overall health risk of air toxics, many questions remain unanswered. In particular, the tools and techniques for assessing project-specific health outcomes as a result of lifetime MSAT exposure remain limited. These limitations impede the ability to evaluate how the potential health risks posed by MSAT exposure should be factored into project-level decision-making within the context of the National Environmental Policy Act (NEPA).

“Nonetheless, air toxics concerns continue to be raised on highway projects during the NEPA process. Even as the science emerges, we are duly expected by the public and other agencies to address MSAT impacts in our environmental documents. The FHWA, EPA, the Health Effects Institute, and others have funded and conducted research studies to try to more clearly define potential risks from MSAT emissions associated with highway projects. The FHWA will continue to monitor the developing research in this emerging field.

[2] April Marchese, “Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents”, Memorandum, addressed to FHWA Division Administrators, September 30, 2009.

NATIONAL MSAT EMISSION TRENDS 1999 – 2050
FOR VEHICLES OPERATING ON ROADWAYS
USING EPA's MOBILE6.2 MODEL



Note: (1) Annual emissions of polycyclic organic matter are projected to be 561 tons/yr for 1999, decreasing to 373 tons/yr for 2050.
(2) Trends for specific locations may be different, depending on locally derived information representing vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors

Source: U.S. Environmental Protection Agency. MOBILE6.2 Model run 20 August 2009.

Figure 2 MSAT Trends

3.2 NEPA Context

"The NEPA requires, to the fullest extent possible, that the policies, regulations, and laws of the Federal Government be interpreted and administered in accordance with its environmental protection goals. The NEPA also requires Federal agencies to use an interdisciplinary approach in planning and decision-making for any action that adversely impacts the environment. The NEPA requires and FHWA is committed to the examination and avoidance of potential impacts to the natural and human environment when considering approval of proposed transportation projects. In addition to evaluating the potential environmental effects, we must also take into account the need for safe and efficient transportation in reaching a decision that is in the best overall public interest. The FHWA policies and procedures for implementing NEPA is prescribed by regulation in 23 CFR § 771."

3.3 MSAT Analysis Guidance

"The FHWA developed a tiered approach for analyzing MSAT in NEPA documents, depending on specific project circumstances. The FHWA has identified three levels of analysis:

(1) No analysis for projects with no potential for meaningful MSAT effects [Tier I];
(2) Qualitative analysis for projects with low potential MSAT effects [Tier II]; or
(3) Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects [Tier III]."

3.3.1 Exempt Projects or Projects with No Meaningful Potential MSAT Effects

"The types of projects included in this category [Tier I] are:

- Projects qualifying as a categorical exclusion under 23 CFR 771.117(c);
- Projects exempt under the Clean Air Act conformity rule under 40 CFR 93.126; or
- Other projects with no meaningful impacts on traffic volumes or vehicle mix.

"For projects that are categorically excluded under 23 CFR 771.117(c), or are exempt under the Clean Air Act pursuant to 40 CFR 93.126, no analysis or discussion of MSATs is necessary. Documentation sufficient to demonstrate that the project qualifies as a categorical exclusion and/or exempt project will suffice. Projects with no or negligible traffic impacts, regardless of the class of NEPA environmental document, no MSAT analysis is required. However, the project record should document the basis for the determination of "no meaningful potential impacts" with a brief description of the factors considered."

3.3.2 Projects with Low Potential MSAT Effects

"The types of projects included in this category [Tier II] are those that serve to improve operations of highway, transit or freight without adding substantial new capacity or without creating a facility that is likely to meaningfully increase MSAT emissions. This category covers a broad range of projects.

"[It is anticipated] that most highway projects that need an MSAT assessment will fall into this category. Any projects not meeting the criteria in [Section 3.3.1] or [Section 3.3.3] as follows should be included in this category. Examples of these types of projects are minor widening projects; new interchanges, such as those that replace a signalized intersection on a surface street; or projects where design year traffic is projected to be less than 140,000 to 150,000 annual average daily traffic (AADT).

"For these projects, a qualitative assessment of emissions projections should be conducted. This qualitative assessment would compare, in narrative form, the expected effect of the project on traffic volumes, vehicle mix, or routing of traffic and the associated changes in

MSAT for the project alternatives, based on VMT, vehicle mix, and speed. It would also discuss national trend data projecting substantial overall reductions in emissions due to stricter engine and fuel regulations issued by EPA. Because the emission effects of these projects are low, we expect there would be no appreciable difference in overall MSAT emissions among the various alternatives. In addition, quantitative analysis of these types of projects will not yield credible results that are useful to project-level decision-making due to the limited capabilities of the transportation and emissions forecasting tools."

3.3.3 Projects with Higher Potential MSAT Effects

"This category [Tier III] includes projects that have the potential for meaningful differences in MSAT emissions among project alternatives. A limited number of projects [are expected] to meet this two-pronged test. To fall into this category, a project must:

- Create or significantly alter a major intermodal freight facility that has the potential to concentrate high levels of diesel particulate matter in a single location; or
- Create new or add significant capacity to urban highways such as interstates, urban arterials, or urban collector-distributor routes with traffic volumes where the AADT is projected to be in the range of 140,000 to 150,000, or greater, by the design year;

And also

- Proposed to be located in proximity to populated areas."

These projects would require a quantitative analysis of potential MSAT emissions for the seven priority MSATs for each alternative.

3.3.4 Opportunity Corridor

The approximately 3.0 mile long Opportunity Corridor project begins near I-490 at East 55th Street at the southwest and terminates along East 105th Street near US-322 (Chester Avenue) at the northeast. The proposed alignment parallels the existing railroad transportation corridor that contains the rail lines owned and operated by the NS and the GCRTA from East 55th Street to East 105th Street and then follows East 105th Street to the north. The study area consists of residential, commercial, industrial and recreational areas.

The Certified 2020 Design Year traffic ranges from 46,730 ADT at the western terminus to 15,000 ADT at the northern terminus. Therefore, since the projected traffic volumes are less than 140,000 ADT this project has a low potential to affect MSAT emissions and a Tier II qualitative analysis was prepared.

The existing (2010) and No-Build (2020) daily vehicle miles travelled (VMT) in the Opportunity Corridor study area were developed by creating a conservative network of roadways consisting of roads that intersected with the Opportunity Corridor or became part of the Opportunity Corridor. The length of these various roadway links ranged from 0.1 to 1.2 miles. The existing (2010) and No-Build (2020) ADT on these links were multiplied by the length to determine the VMT. The Build (2020) VMT was developed by adding Opportunity Corridor links to the existing and No-Build network and applying the Build (2020) ADT.

Table 1
Projected Daily Vehicle Miles Travelled (VMT) In the Study Area

<table>
<tr><th rowspan="2">Existing 2010</th><th rowspan="2">No-Build 2020</th><th rowspan="2">% Change Existing to No-Build</th><th colspan="2">Preferred Alternative</th><th rowspan="2">% Change Existing to Preferred Alternative</th><th rowspan="2">% Change No-Build to Preferred Alternative</th></tr>
<tr><th>Existing Arterials 2020</th><th>New Corridor 2020</th></tr>
<tr><td rowspan="2">76,271</td><td rowspan="2">74,179</td><td rowspan="2">-2.7%</td><td>69,369</td><td>85,818</td><td rowspan="2">203%</td><td rowspan="2">209%</td></tr>
<tr><td colspan="2">155,187</td></tr>
</table>

Source: HNTB Ohio, Inc, November 2012.

4.0 TIER II QUALITATIVE MSAT ANALYSIS

"A qualitative analysis provides a basis for identifying and comparing the potential differences among MSAT emissions, if any, from the various alternatives. The qualitative assessment presented below is derived in part from a study conducted by the FHWA entitled A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives, found at:
www.fhwa.dot.gov/environment/air_quality/air_toxics/research/methodology/methodology00.cfm."

The amount of MSATs emitted in the Opportunity Corridor study area would be proportional to the VMT, assuming that other variables such as fleet mix are the same for each alternative. As shown in Table 1, there will be reductions in VMT with the Build Alternative along the existing local arterials as the Opportunity Corridor provides a more direct route from I-490 to the developing areas along East 105th St. Table 1 also indicates the VMT within the new sections of the Opportunity Corridor, from I-490 to East 105th St. would increase. Regardless of the alternative chosen, emissions will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce annual MSAT emissions by 72 percent from 1999 to 2050. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the immediate study area are likely to be lower in the future in virtually all locations.

Under each alternative there may be localized areas where VMT would increase (e.g., along the Opportunity Corridor/East 105th St.) and other areas where VMT would decrease (e.g., East 55th St., Woodland Ave., portions of Kinsman Road and Quincy Ave). Therefore, it is possible that localized increases and decreases in MSAT emissions may occur. The localized increases in MSAT emissions would likely be most pronounced along the new roadway sections that would be built along the Opportunity Corridor from East 55th Street northeast to Quincy Avenue and along East 105th Street between Quincy Avenue and Chester Avenue. However, even if these increases do occur, they too will be substantially reduced in the future due to implementation of EPA's vehicle and fuel regulations.

In sum, under the Build Alternative in the design year it is expected there would be reduced MSAT emissions in the projects immediate study area, relative to the No Build Alternative, due to the reduced ADT on the existing local streets associated with more direct routing of the Opportunity Corridor, and due to EPA's MSAT reduction programs.

4.1 Incomplete Or Unavailable Information for Project-Specific MSAT Health Impacts Analysis

“In FHWA’s view, information is incomplete or unavailable to credibly predict the project-specific health impacts due to changes in MSAT emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and speculation rather than any genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a proposed action.

“The U.S. Environmental Protection Agency (EPA) is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. They are the lead authority for administering the Clean Air Act and its amendments and have specific statutory obligations with respect to hazardous air pollutants and MSAT. The EPA is in the continual process of assessing human health effects, exposures, and risks posed by air pollutants. They maintain the Integrated Risk Information System (IRIS), which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects" (EPA, http://www.epa.gov/ncea/iris/index.html). Each report contains assessments of non-cancerous and cancerous effects for individual compounds and quantitative estimates of risk levels from lifetime oral and inhalation exposures with uncertainty spanning perhaps an order of magnitude.

“Other organizations are also active in the research and analyses of the human health effects of MSAT, including the Health Effects Institute (HEI). Two HEI studies are summarized in Appendix D of FHWA's Interim Guidance Update on Mobile source Air Toxic Analysis in NEPA Documents. Among the adverse health effects linked to MSAT compounds at high exposures are cancer in humans in occupational settings; cancer in animals; and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious is the adverse human health effects of MSAT compounds at current environmental concentrations (HEI, http://pubs.healtheffects.org/view.php?id=282) or in the future as vehicle emissions substantially decrease (HEI, http://pubs.healtheffects.org/view.php?id=306).

“The methodologies for forecasting health impacts include emissions modeling; dispersion modeling; exposure modeling; and then final determination of health impacts - each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70 year) assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame, since such information is unavailable. The results produced by the EPA's MOBILE6.2 model, the California EPA's Emfac2007 model, and the EPA's DraftMOVES2009 model in forecasting MSAT emissions are highly inconsistent. Indications from the development of the MOVES model are that MOBILE6.2 significantly underestimates diesel particulate matter (PM) emissions and significantly overestimates benzene emissions.

“Regarding air dispersion modeling, an extensive evaluation of EPA's guideline CAL3QHC model was conducted in an NCHRP study (http://www.epa.gov/scram001/dispersion_alt.htm#hyroad), which documents poor model performance at ten sites across the country - three where intensive monitoring was conducted plus an additional seven with less intensive monitoring. The study indicates a bias of the CAL3QHC model to overestimate concentrations near highly congested intersections and underestimate concentrations near uncongested intersections. The consequence of this is a tendency to overstate the air quality benefits of mitigating congestion at intersections. Such poor model performance is less difficult to manage for demonstrating compliance with National Ambient Air Quality Standards for relatively short time frames than it is for forecasting individual exposure over an entire lifetime, especially given that some information needed for estimating 70-year lifetime exposure is unavailable. It is particularly difficult to reliably forecast MSAT exposure near roadways, and to determine the portion of time that people are actually exposed at a specific location.

"There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI (http://pubs.healtheffects.org/view.php?id=282). As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for diesel PM. The EPA (http://www.epa.gov/risk/basicinformation.htm#g) and the HEI (http://pubs.healtheffects.org/getfile.php?u=395) have not established a basis for quantitative risk assessment of diesel PM in ambient settings.

"There is also the lack of a national consensus on an acceptable level of risk. The current context is the process used by the EPA as provided by the Clean Air Act to determine whether more stringent controls are required in order to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect for industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries. The decision framework is a two-step process. The first step requires EPA to determine a "safe" or "acceptable" level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than 1 in a million due to emissions from a source. The results of this statutory two-step process do not guarantee that cancer risks from exposure to air toxics are less than 1 in a million;in some cases, the residual risk determination could result in maximum individual cancer risks that are as high as approximately 100 in a million. In a June 2008 decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld EPA's approach to addressing risk in its two step decision framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than safe or acceptable.

"Because of the limitations in the methodologies for forecasting health impacts described, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities plus improved access for emergency response, that are better suited for quantitative analysis."

5.0 CONCLUSION

In this report, the FHWA and ODOT have provided a qualitative analysis of MSAT emissions relative to the Opportunity Corridor No-Build and Build alternatives. The FHWA and ODOT have acknowledged that the project may result in increased exposure to MSAT emissions in certain locations, although the concentrations and duration of exposures are uncertain, and because of this uncertainty, the health effects from these emissions cannot be reliably estimated. With either the No-Build or Build Alternatives, MSAT emissions in the study area will be substantially reduced in the future due to implementation of EPA's vehicle and fuel regulations.

6.0 REFERENCES

Burbank, Cynthia J., Memorandum to Division Administrators, "Interim Guidance on Air Toxic Analysis in NEPA Documents", Federal Highway Administration, February 3, 2006.

Marchese, April, Memorandum to FHWA Division Administrators, "Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents", September 30, 2009.

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